DOCUMENT RESUME

ED 427 730 IR 019 281

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TITLE Cognitive and Social Functions of Course Web Sites.
PUB DATE 1998-11-00
NOTE 7p.; In: WebNet 98 World Conference of the WWW, Internet and Intranet Proceedings (3rd, Orlando, FL, November 7-12, 1998); see IR 019 231.
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Cognitive Processes; College Faculty; *Computer Uses in Education; Content Analysis; Conventional Instruction; Course Content; Higher Education; Interviews; Material Development; Qualitative Research; Role; Social Influences; Tables (Data); Teacher Attitudes; *Teacher Developed Materials; Use Studies; *World Wide Web
IDENTIFIERS Learning Environments; *Technology Role; Technology Utilization; University of Georgia

ABSTRACT

The work reported in this paper is part of an ongoing qualitative study of faculty uses of the Internet at the University of Georgia. The goal of the study is to categorize the functions of "class pages" (i.e., World Wide Web sites that have been personally developed by instructors to support traditional face-to-face classes) from both researcher and faculty perspectives. Using a qualitative content analysis approach, the functions of 25 publicly accessible class Web sites were analyzed. The following functions were identified: course management, instructional text, instructional graphics, Internet resources, software, and communication. A subset of five Web site authors were then interviewed. It was found that: all sites performed course management functions valued by instructors; a small subset also demonstrated easily implemented, successful, and pedagogically interesting uses of the Web; and pages in the sample conveyed implicit and explicit social information to students about the class and instructor through four primary channels. A graph of the class Web page functions is included. Three tables present data on: cognitive aspects of learning environments represented in class Web pages; socialization strategies found within class pages; and profiles of interviewed instructors. (Author/AEF)

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Cognitive and Social Functions of Course Web Sites

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Abstract: The work reported here is part of an ongoing qualitative study of faculty uses of the Internet. The goal of our work is to categorize the functions of class web sites from both researcher and faculty perspectives. Using a qualitative content analysis approach, we first analyzed the functions of 25 publicly accessible class web sites. We then interviewed a subset of the sites' authors. We found that all sites performed course management functions valued by instructors; that a small subset also demonstrated easily implemented, successful, and pedagogically interesting uses of the web; and that pages in our sample conveyed implicit and explicit social information to students about the class and instructor through four primary channels.

Introduction

When the possibility of using the Web to teach my course became available, I knew that I had found my answer. I was now able to provide information and pictures to my students at a pace to fit their needs. My incentive for using the Web-based instruction was simply to provide the students the best possible method for them to learn the subject matter. [Dr. Charles W. Heuser, Jr., cited in Williams & Peters 1997, p. 108]

Administrative propaganda routinely alludes to an alleged student demand for the new instructional products. At UCLA officials are betting that their high-tech agenda will be "student driven," as students insist that faculty make fuller use of the Web site technology in their courses. To date, however, there has been no such demand on the part of students, no serious study of it, and no evidence for it. [Noble, 1998]

It is hardly surprising that there are both enthusiasts and opponents among academics when it comes to utilizing an innovation as controversial as the world wide web (WWW) in higher education. Universities and colleges are spending huge sums on networks, computers, and software to support the integration of the WWW into courses, and faculty are appropriately vested in scrutinizing any such investments of scarce academic resources. Recently, a backlash against using the web in higher education has received wide publicity in North America (Noble, 1998). In the midst of such controversy, it is essential to examine what individual instructors are doing with the WWW in their courses.

This paper reports on a qualitative investigation of instructional uses of the world-wide web (WWW) at The University of Georgia. This study focuses on "class pages," i.e., web sites that have been personally developed by instructors to support traditional face-to-face classes, rather than those rare courses that are primarily delivered via the WWW. The participants in this study are early adopters of the web for instruction. Their sites, typically developed with little or no computer assistance nor instructional design (ID) support, range in complexity, interactivity, and function.

The goals of our research are, first, to describe how instructors "naturally" use the web to support instruction, specifically how those without technical training or ID support use the web instructionally, and second, to describe how instructors themselves perceive the impact of their pages on instruction. Our first step was to critically assess a sample of existing, faculty-developed class pages from multiple perspectives. Next, we interviewed a subset of faculty members who developed the pages we had assessed, to understand how they conceptualized the functions of their pages. These data provide a snapshot of the current state of web-based instruction at one institution, and give us insight into the diverse and sometimes unexpected instructional and social functions of class pages.

Content Analysis of Class Pages

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We selected a sample of 25 class pages that were publicly accessible from our university's homepage, including graduate and undergraduate courses from disciplines such as astronomy, biology, economics, education, mathematics, pharmacy and veterinary medicine. We then categorized the instructional elements of these pages, adding categories and revisiting pages until we felt that all the functions represented in our sample were described. The results of this initial qualitative content analysis are presented in [Fig. 1]. Despite the range of possibilities for class pages, we found that most sites are static, consisting only of course-relevant text such as syllabi, course notes, and procedural information such as attendance policies. All 25 pages served *course management* functions, conveying information about class schedules, instructor availability, and required texts. Most class pages also included *instructional text* such as lecture notes or articles. Fewer pages displayed content-related *graphics*, made extensive course use of *Internet resources* through hyperlinks, provided downloadable *software or digital files*, or promoted *communication* via E-mail, listservs, or newsgroups.

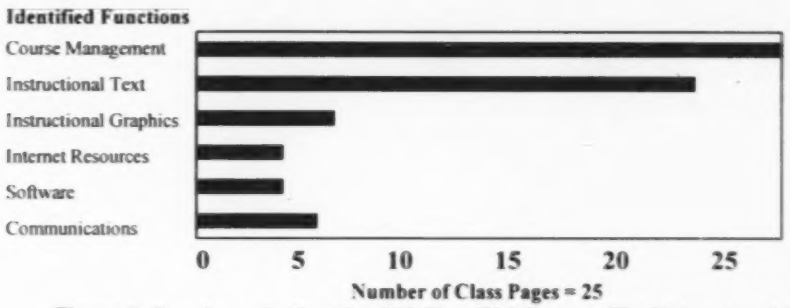

Figure 1: Functions of a Sample of 25 Class Web Pages at The University of Georgia.

We next considered the pages in light of a model of classrooms as learning environments. Perkins classifies the features of classrooms as learning environments in terms of five functions or facets. These include: *information banks, symbol pads, construction kits, phenomenaria,* and *task managers* [Tab. 1]. Of these five facets, most sites serve only two roles: information bank and task manager. To the extent they provide course content in the form of lecture notes, references, or domain hyperlinks, pages are, like textbooks, *information banks*. In providing assignment schedules, answers to homework problems, and test preparation suggestions, pages function as *task managers*. Our analysis suggests that instructors are quite comfortable using web sites as information banks and task managers. Pages function less frequently as construction kits or phenomenaria, the facets most associated with rich, student-centered learning environments. As an exception, a math education instructor in our sample uses his pages to disseminate Geometer's Sketchpad files and spreadsheets to students whose machines had the appropriate helper applications. Subsequently, students used the associated software tools to build their own problem solutions and posted them back to the web site for critique.

Facet	Function	Class example	Web example	n*
Information Banks	Provides content information	Textbook, instructor	Domain-relevant sites	25
Symbol Pads	Supports off-loading of cognitive tasks	Calculator, word-processor, pen & paper	Groupware functions	1
Construction Kits	Provides domain-relevant tools to support creative activity	Lab equipment, Systems modeling software	Domain-related web products (i.e. teachbacks)	2
Phenomenaria	Makes phenomena accessible to scrutiny and manipulation	Microworlds, fishtanks	Realtime data; Domain activity as it appears on web	1
Task Managers	Sets, guides, and provides feedback on course tasks	Instructor, "study guides," & students themselves	Online syllabi	25

*from Perkins (1991) +the # of pages in our sample (N=25) displaying these aspects.

Table 1: Cognitive Aspects of Learning Environments Represented in Class Web Pages.

As accessible and enduring documents that describe courses and provides samples of typical class activity, class pages also serve a valuable socializing function. They offer students a variety of clues to their instructors' goals, beliefs, and attitudes toward teaching, learning, and class structure. Some clues are implicit, some explicit, but all are useful to students

as they build a model of successful behavior in that class setting. As we scrutinized class pages, we became aware of a diversity of social information. Using qualitative content analysis, we categorized the social functions we saw represented in our sample of pages. We identified four social aspects of classes that instructors convey via their web sites: *behavioral expectations*, *course philosophy*, *class community*, and *instructor persona* [Tab. 2].

Facet	Definition	Examples from UGA Class Pages	n
Behavioral Expectations	Descriptions of expectations for student behavior in course.	Attendance policies, class participation expectations, sanctions, etc.	22
Course Philosophy	Explicitly conveys attitudes regarding student-instructor interactions and roles.	Learning contracts, philosophy statements, meaningful quotes about learning or teaching, etc	2
Class Community	Graphics or text which support sense of the class as a community.	Digitized images of class interactions, linked student homepages, daily class logs, etc.	3
Instructor Persona	Graphics or text which convey instructor's personality.	Pictures of instructor, non-instructional cartoons, animations, "fun" links etc.	5

Table 2: Socialization Strategies Found Within Class Pages.

To the extent that cues in each of these areas rely upon text, they might be delivered equally well by a print course syllabus distributed on the first day of class. However, within the sites we observed, the web extends the socializing power of the traditional syllabus document in at least three ways: through page design, community building mechanisms, and personalization. First, user-friendly html authoring systems and graphics software packages allow instructors to visually emphasize the issues that concern them most, be they behavioral, instructional, or attitudinal. Using templates and tools, instructors can present their students with web pages that have high face validity; they look professional and important, especially for those students to whom the WWW is still a novelty. Conversely, lack of attention to design (look and feel) elements such as background color and font choice may inadvertently convey an impression that the instructor does not intend. Second, instructors use class pages explicitly to define and to support the social environment they desire in their classroom. The most common community building strategy is to provide links to student home pages. Other community building strategies used by instructors in our sample were to post top student projects as exemplars, to encourage collaborations among students by using the site as a public area for posting and critiquing class work, and to keep up a continual, if one-sided, dialog with students about class activities and achievements through a "class log". Third, some instructors use their web pages to give students information about themselves outside the range generally found in course documents. This may be no more than a link to a current vita, perhaps including a picture, or it might be a link to a homepage featuring family and hobbies. Other pages invite students to see their instructors as "people not professors" through blatant personality indicators such as goofy photos, "fun links," and graphics, animations, or links that are unrelated to course content.

The findings reported above suggested to us that, from a social perspective, class pages might convey significant information to students about behavioral expectations, about the relationship they can anticipate with the instructor, and perhaps about other features of the class as a social learning environment. From an instructional perspective, using the web to provide text online to students may be seen by instructors as its legitimate, even sufficient, function. This usage may have obvious benefits as a way to centralize course information, to facilitate faculty-to-student transfer of current course documents, to reduce time-consuming but low-level interactions with students outside class, and to transfer printing and duplication costs away from the instructor. In analyzing web sites without reference to the intentions and ensuing instructional experiences of instructors, we largely saw course management and text transfer functions represented. As unsurprising as it may be that instructors initially transfer their print-based teaching approaches to the web, the potential of the WWW to enhance teaching and learning is barely tapped by these fundamental applications. However, our view of site functions was expanded through faculty interviews.

Interviews With Instructors

The observational results described above led us to interview faculty members whose pages we had analyzed. Our primary

goal in these interviews has been to identify instructional, cognitive, and social outcomes instructors attribute to their class pages. The grounded theory approach guided our data collection and analysis, entailing purposeful selection of participants, semi-structured interviews, and constant comparative analysis. The results reported here include data from five interviews with instructors whose pages were particularly rich in social information, instructional resources, or both. Demographic information about the participants is provided in Table 3.

Name*	Faculty Rank	Past Instructional Technology Use?	Typical Class Size	Selection Basis**	Unique Page Features
Denise	Assoc.	None	100+	S	Exuberant 1st person descriptions, graphics
Michael	Full	Used PowerPoint to support class lectures	100+	S	Extensive data on self as teacher (teaching ratings, etc.); lots of work on layout
Hal	Full	None, but 30+ years programming	100+	I	Material extensively hyperlinked, daily log with internal and external links to relevant resources, realia
John	Full	Consistent PC and software use in instruction	~20	S / I	Prominent link to personal homepage w/ family, interests; posted student productions, realia
Phil	Assoc.	Consistent use of CAI, e.g., Toolbook, Authorware	100+	I	Posted student productions, instructional games, official course notes

*Pseudonym

** S = Social features of website; I = Instructional features of website

Table 3: Profiles of Interviewed Instructors.

Tape-recorded interviews occurred in participants' offices with one or both researchers, and were subsequently transcribed by one of the researchers. Our semi-structured interview protocol included nine core questions:

- How are you using the Internet to support your research activities?
- How do you use the Internet to support service activities?
- What were your goals in creating your course page?
- What effect has the page had on instruction?
- How has the page affected the social aspects of teaching your class?
- What problems have you had with the course site?
- What do your colleagues think about your site?
- What are your plans for changing the site?
- Could you tell us your predictions for the web in higher education?

In the present discussion we confine ourselves to the subset of findings most relevant to the instructional and social functions of our participants' pages. Our observations from the content analysis about the dominance of course management and information bank functions of class pages were borne out in every interview. The pages served faculty well as a way to provide central access to course syllabi, daily updates, and changes to the class schedule, or to facilitate transfer of text-based content resources or software. These "housekeeping" functions reduced repetitive and time-consuming interactions with students.

> *[S]tudents always come up and say "I wasn't here on Tuesday, what did we cover? So this takes care of that, it also gives them a way of having announcements, so I don't have to get any of this "Is there anything I missed?" kind of stuff.* - *Denise*

Participants commented that course pages helped students build web skills, although this may not have been an instructional goal in the first place. In addition, Phil, a professor in the school of veterinary medicine, found that his students used the web to locate and consult resources for equivalent courses at other institutions, thus breaking down institutional borders in instruction. Due to a unique feature of his page (professionally-taken class notes that were posted within 24 hours of a lecture), Phil described reduced note-taking (greater attention) by students during lecture. Phil, Denise, Hal, and John all noted increased student engagement, effort, and time-on-task with class web activities:

> *And I really don't know how to attribute to the web or the course or what, but these students really work long and hard on stuff much more than I've explicitly said I want them to do.* - *John*

It should be noted that all these faculty members were also aware of the potential novelty effect that could be working to their benefit as early adopters of the WWW.

Michael differed from other participants by conceptualizing and experiencing the web primarily as a mode for conveying information, rather than as a technology that provides unique and motivating affordances for instruction:

> *I think for some, and this is where I've come with the web page, where I'm at right now, for some students the web page is a godsend. For people that aren't real well organized, that need to know where are Dr. X's notes, and there they are at 2:00 in the morning trying to track down a page of something. For some students, whatever their needs are, the web meets those needs very, very well.* – Michael

Among those interviewed, Michael's site was the "flattest" in the sense that it provided content in the form of notes, a syllabus, and information about the instructor, but did not engage the students any further through web-based activities.

Two findings from the interviews indicate unexpected ways that course sites may actually correspond to Perkins' [1991] descriptions of learning environments. For Denise, the web itself might be described as a form of phenomenaria where the phenomena under scrutiny is the vast diversity of course-relevant information itself. Denise assigns her students an extra credit project in which students receive points for providing new URL's for her "links" page. The sites must be pertinent to the course, new to her list, and evaluated by the student.

> *And one of the things I love about [the web]–which is probably the bane of some people's existence– is: everything is open to you. You just have to sift through until you find what you want. But when you say "green dogs" you're going to get everything from scientific papers on green dogs, to my dream about green dogs, to the green dog in Australia. And I love that because it's wonderfully--broadening--is the way I'd put it.* – Denise

The open world of the Internet gives students a window on the breadth of their topic, participants in the topic, and topical variations on key words. This diversity requires that students be able to, as Denise said, "sift through" information and make informed choices about "what you want."

Our interviews also suggest that publicizing student work can transform "information bank" and "task management" aspects of a course by transferring these functions toward the student. As we suggested in the first part of this paper, the Internet facilitates publicizing academic work in more than one way. For example, listservs and newsgroups can publicize thinking through correspondence, or, once a professor has a web page, it can be a relatively simple matter to post student work publicly. Denise and John, the two participants who capitalized most on this aspect of the web, provide clear indications of the benefits. For example, students can use each other as content resources (information banks):

> *I thought that one of the things that was interesting was that the students would use themselves as resources. They would go on the newsgroup and say you know, "Number 16 is just-- I'm getting this--and I'm not sure it makes sense? Is everyone else getting this or is there something else going on?" And other students would come up with what they were doing. Which was really wonderful* - Denise

Of course students will consult each other as course resources, web or no web. The difference is that in a public forum like a listserv or newsgroup, non-participants can also benefit from these peer exchanges.

The findings presented in this section remind us of the unanticipated benefits that can result from experimentation. All five of our participants began their sites with narrow goals of supporting instruction with a centralized content base: an "information bank" function. Four of them also wove Internet-specific functions into their sites, such as:

- extensively hyper-linked content;
- "one stop shopping" in which course, communication, and Internet search resources are centrally available;
- repositories of student work online; or,
- web-based student assignments.

One widely shared observation among our respondents was that student-instructor interactions changed in response to the course page: the page and class use of the Internet provided something new for students and instructors to talk about. Similarly, the page can be team-building in the sense that it creates a shared experience for students, even across class sections. For true novice web-users like Denise, dealing with quirks or problems with the page provided a shared problem-solving experience for her and her students. Our interest in how course pages convey social information centers on how they might influence student beliefs and expectations about the instructor or class. We found that instructors described two effects which we termed "equalizing" and "humanizing." Class pages can humanize the learning experience for students by giving them access to other, non-academic views of their professors. The humanizing function of pages is

closely related to the idea of equalizing the status between students and faculty. Our interviews support our conclusion that some faculty explicitly recognize this equalizing effect:

> *Students have told me that it sort of energizes them and they get an idea of who I am, and I don't feel so aloof to them when I see them, as though I'm this far away professor.* – Denise

The idea that course pages can serve the instructional function of reducing the role of the instructor as an omniscient external authority deserves further investigation.

Our interview data also indicate that the social effects of pages for instructors far exceed the boundaries of the class as a social unit. Perhaps some of the most important outcomes are not between instructors and their students, but rather between instructors and their peers. Although these findings are outside the scope of the current paper, briefly, our respondents report that their pages have, for example, changed colleagues' view of "who they are" and "what they can do," or have provided entrée for meeting people at national meetings.

Conclusions and Directions for Future ResearchAlternative Evaluation Models for Course Web Pages

Our work suggests that, although instructors' stated goals are functional and pragmatic, outcomes exceed expectations seemingly in proportion to the degree instructors use the unique qualities of the web. Similarly, while instructors may want their pages to perform "housekeeping" functions as a baseline, they are interested in understanding the more substantive instructional functions that their pages may potentially perform. Our perspective on course sites' *task management* and *phenomenaria* functions changed in the interview phase of the study. By publicizing student work, the course sites may encourage students to take more responsibility for task management. The totality of web-based, domain-related activity might be construed as phenomena that instructors can build into their courses. In addition, the interview data largely supported our content analysis of class pages as delivery vehicles for socio-cultural information. The casual, grassroots history and culture of the web may inspire some faculty to present themselves differently on the web than they do otherwise, thus humanizing and equalizing the class learning environment. Conversely, the self-selecting group of early adopters may be those who already strive for a collaborative model of instruction.

Along with continuing our interviews and introducing student perspectives into our work, as a next step we are conducting a campus-wide survey based upon our interview results for studying course web sites. A flurry of instruments and models have begun to appear to assist in evaluating web pages designed for teaching and learning. Different evaluation schemes have focused on criteria such as content, user interface, page design, implementation, and utility. While there is considerable creativity in many of these schemes, none highlights the cognitive and social functions of web pages. In addition, the existing instruments are mainly meant to be employed by external evaluators. We believe that practical evaluation of course web sites demands an internal perspective. The current interest in web page evaluation and research provides many interesting opportunities for further R&D. Ultimately, we may be able to examine and enhance more significant aspects of courses such as the cognitive and social aspects we describe above. After all, if nothing else, course web pages have the potential to throw open the classroom door to reveal what really happens within specific classes. The very act of making public one's syllabus may be just the spur some faculty need to consider more carefully and improve the articulation among objectives, assignments, tasks, and assessments within their courses.

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